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10/036,198	12/28/2001	Chris Rich	WVFRNT.001A	2841
20995	7590	03/22/2004	EXAMINER	
KNOBBE MARTENS OLSON & BEAR LLP 2040 MAIN STREET FOURTEENTH FLOOR IRVINE, CA 92614			ANGEBRANDT, MARTIN J	
			ART UNIT	PAPER NUMBER
			1756	

DATE MAILED: 03/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/036,198

Applicant(s)

RICH ET AL.

Examiner

Martin J Angebrannt

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 16 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-59,99 and 109-111 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-59,99 and 109-111 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

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1. The response filed by the applicant has been read and given careful consideration.

Responses to the arguments of the applicant are presented after the first rejection to which they are directed. The non-elected claims have been cancelled, but may be pursued in a later application. The language added to claims 1,33,34 and 99 are held to render them inoperative as discussed below. Accordingly, the rejection previously applied to them are withdrawn, but these maybe reinstated without prejudice if the most recent amendment is withdrawn/cancelled.

2. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3 Claims 1-40,99 and 109-111 are rejected under 35 U.S.C. 101 because the disclosed invention is inoperative and therefore lacks utility.

The applicant has amended the claims 1, 33 and 99 to recite the use of a contact exposure process where light is passed through the master and diffractive features comprising refractive index variations **in said layer** .....through non-interference effects” and claim 34 now recites the use of a contact exposure process where light is passed through the master and diffractive features to non-holographically form refractive index variations **in said layer**”. This is not possible as to form the **refractive index variations in the layer** requires a interferometric/holographic exposure. With respect to claim 41, the use of a volume holographic master is embraced by this and would be functional as the diffraction arises from the refractive index modulation **within** the volume holographic master, not the surface relief. With respect to claims 41 and 47, the diffractive features need not be more than a mere surface relief grating or

hologram as the claim does not require refractive index modulation in the formed product.

Further discussion appears below.

To form a diffractive article where there is a variation in the refractive index (a volume holographic image), it is recognized in the art that the pattern recorded is that of a wavefront (wave information, Caulfield et al. "The applications of Holography" (1971) pp. 1.) This is more information than is recorded in a simple photograph and require a reference (reference beam, Caulfield et al. "The applications of Holography" (1971) pp. 5.) to measure the wavefront relative to as the detectors only measure intensity. The two beams interfere and the result is a pattern of constructive and destructive interference where patterns have a higher intensity (bright) are where the object and reference beams/light are in phase and where the pattern has a lower intensity (dark) are where the beams destructively interfere. The beams are generally somewhat explicit as discussed in chapter III of Caulfield et al. "The applications of Holography" (1971) pp. 17-22, but may be more subtle as in the case of the Gabor hologram (page 23-25), materials having built in reference beams (page 25) or able to generate reference beams locally (page 26-30). In the case of transmissive gratings, the undiffracted beam acts as the reference light and the first order diffraction is the object light. In the case of the Gabor hologram, **diffraction about a small, opaque object placed in the beam path** is used to generate the second wave.

In the case of the instant invention, there is no disclosed opaque object in the beam path to generate the second beam so the technique is not akin to that of Gabor. In the case of the instant invention, a surface relief pattern is contacted with a photocurable material. This will inherently yield a photocured produce bearing the negative of the surface relief pattern, which it

was contacted with. (protrusions where the despressions were in the surface relief pattern (see figures 6b and 6c of the instant specification)). If the surface was a diffractive surface relief, then a surface diffraction pattern will inherently result due to the curing in contact. Transmission diffraction patterns generate object and reference light. In the case of transmissive gratings or holograms, the undiffracted beam acts as the reference light and the first order diffraction is the object light.

With surface relief diffractive articles (no subsurface refractive index modulation, relief gratings), this occurs at the relief surface. If this surface relief is obscured by index matching fluid or the like, then no diffraction can occur at the surface and the light passes through the layer unmodified except by slight variations in the intensity due to differences in the amount of light absorbed by the different path lengths occurring at different thicknesses of the surface relief at that portion. The surface relief masters of the instant invention are disclosed as transparent [0039] and further these variations in thickness are only a few tens or hundreds of nm in thickness of several hundred microns or mm so no difference in the curing occurs due to the variation in absorption. When exposure takes place through the transmission surface relief hologram or grating and the surface is available/unobscured, then interference patterns are inherently generated.

With volume diffractive articles, the majority of the diffraction is due to the refractive index modulation throughout the thickness of the volume hologram and a few percent is due to the surface relief pattern (see Moss et al. '417). When exposure takes place through the transmission volume hologram or grating, then interference patterns are inherently generated due to the diffraction pattern forming the volume hologram or grating. Obscuring the surface does

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not significantly affect the diffraction, as most of it is due to the fringes formed through the thickness of the volume holographic element.

**Therefore claims 1-40,99 and 109-111 are inoperative and lack utility. The examiner has cited a reference book to support the argued position. The applicant may wish to discuss this with a professor of optics at a major university, such as University of Arizona or the University of Rochester, which both have excellent optics programs. In this discussion, the applicant should supply the relevant portion of the office action, rather than attempt to paraphrase the examiner's position. The applicant may wish to consider limiting the claims to embodiments where a surface relief diffractive master is used and a volume diffractive master is specifically excluded and the light passed through it in the manner described in the claims and provide experimental comparative data Vs the case where the light is shown through the curable material first.**

With respect to claim 6, relief diffractive articles rely upon the variations in optical thickness to achieve diffraction. The optical thickness is the product of the refractive index and the physical thickness. In the case of purely relief diffractive articles, the refractive index is the same throughout the medium and therefore the only difference is the physical thickness of adjacent areas. If this surface is placed in contact with a material having the same refractive index as the layer having the relief image, the interface is hidden (think of optical index matching fluids) and the light passes through undiffracted. Generally if you cannot see the interface, then the light also cannot. (See Kler et al. '075 and Mallik '466 where the diffractive image only becomes visible when the two layers having the same refractive index are separated and by

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inference the teachings of Takeuchi et al. '857 that the refractive index of any coating should be different from that of the hologram layer itself (7/4-18))

**The applicant's response neglects to address the inoperative issue or the enablement. The rejection stands.**

With respect to claims 7 and 24, the curing step of claim 7 and 24 require energy from heat, electron beams or corona charging to pass through the surface relief pattern, to be modulated pattern-wise by the surface relief pattern and to cure the curable material. Materials used to form holograms and similar diffractive articles (ethylenically unsaturated monomers, such as acrylates and vinyl monomers) are curable by light, heat and electron beam. The heat can pass through the relief layer, but is not patterned by the relief surface. Electrons and other electric charges can neither pass through the layer bearing the relief image or be patterned by the relief surface.

The applicant suggests that these materials exist, but fails to point out what they might be. The rejection stands.

The examiner recommends canceling these claims and their embodiments.

4 The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5 Claims 1-40,99 and 109-111 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

See the discussion above in paragraph 3.

The rejection stands of the above reasons.

6 The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7 The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8 Claims 41-48 are rejected under 35 U.S.C. 102(b) as being fully anticipated by Shirasaki et al. '442.

Shirasaki et al. '442 describes with respect to figure 25, **contacting** the phase shifted phase grating mask with a photoresist layer and exposure through the mask with an s-polarized laser to record the pattern in the resist. (17/47-57). The exposed resist before development meets the claims (see Haugh '526, describing the "elimination of such post-exposure steps as developing or fixing" to form a volume hologram on page 7 of copy submitted by the applicant/paragraph 3)

The applicant argues that a light curable material is not disclosed. The examiner points out that photoresist are light sensitive and the **contacting** of the phase shifted diffraction grating mask with the surface would inherently leave a surface pattern. The rejection is one of inherency and the applicant cannot very well argue a teaching away of exemplified subject matter. Claims



41 and 47 do not require anything beyond a surface relief diffraction pattern. As discussed above, the contacting process inherently forms a surface relief in the cured layer. The rejection stands.

9        Claims 41-48 are rejected under 35 U.S.C. 102(b) as being fully anticipated by Okai et al. '637.

Okai et al. '637 describes with respect to figure 25, **contacting** the relief absorption grating mask with a photoresist layer and exposure through the mask with an s-polarized laser to record the pattern in the resist in figure 8. (6/45-55). The exposed resist before development meets the claims (see Haugh '526, describing the "elimination of such post-exposure steps as developing or fixing" to form a volume hologram on page 7 of copy submitted by the applicant/paragraph 3, in patent document col. 8/lines 44-63)

The applicant argues that a light curable material is not disclosed. The examiner points out that photoresist are light sensitive and the **contacting** of the phase shifted diffraction grating mask with the surface would inherently leave a surface pattern. The rejection is one of inherency and the applicant cannot very well argue a teaching away of exemplified subject matter. Claims 41 and 47 do not require anything beyond a surface relief diffraction pattern. As discussed above, the contacting process inherently forms a surface relief in the cured layer. The rejection stands.

10       Claims 41-50 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pettigrew et al. '780.

Pettigrew et al. '780 teaches a master diffraction grating with chromium forming the pattern contacted with a release agent and a light curing resin, where the UV light is passed

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through the master first and then cures the resin as shown in figure 1 b, . (2/7-30) The use of this process with a relief glass master is disclosed. (1/15-20).

It would have been obvious to one skilled in the art to modify the example of Pettigrew et al. '780 by using a glass relief master in place of the glass and chromium master based upon the disclosed to do so.

This is a new rejection and therefore the arguments are moot.

11 Claims 41-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ikeda et al. '033, in view of Moss et al. '417.

Ikeda et al. '033 teach the formation of a master volume phase hologram by exposing a silver halide film, processing it to form an absorption hologram and then bleaching it (1/10-40). The use of proximity exposure of contact exposure through the holographic master (12) and into the photosensitive layer (14) is disclosed with respect to figure 5. (4/51-5/2 and 7/43-8/6). Example 2 uses a volume phase hologram as the master (4) and is coated with the polyvinyl carbazole photoresist layer and a reflection type exposure is used to form a phase type hologram. The term "phase hologram" in the reference described holograms with refractive index fringes formed in the photosensitive layer (3/38-40) which is the same as a volume hologram.

Moss et al. '417 teach that volume holograms have both modulation on the surface (surface relief or thin holograms) and fringes of refractive index modulation throughout the thickness (thick holograms) (2/8-54).

It would have been obvious to one skilled in the art to modify the process of figure 5 to use a phase holographic master based upon the disclosure of the use of volume phase

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holographic masters in example 2 and in column 1 of Ikeda et al. '033 and the master hologram would inherently have a relief pattern corresponding to the refractive index modulated fringes where they intersect the surface of the volume holographic master based upon the teachings of Moss et al. '417.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

12 Claims 41-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pettigrew et al. '780, in view of Haugh '526.

Haugh '526 teaches the previous use of silver halide and conventional resist materials such as dichromated gelatin or the like have disadvantages in that extensive post processing is required and the silver halide materials are relatively expensive. (col. 2/lines 29-65). The use of free radically polymerizable materials, such as acrylates, is disclosed throughout (3/22-6/25). The use of contact copying methods where the radiation passes through the master is disclosed. (6/6/57-75) The use of various light sources in making copies, including UV sources such as arc or vapor lamps is disclosed. (7/15-27). The image produced during the exposure does not require post processing (8/43-63). When contact is close (0.001 in) then resolution is not lost when using an incoherent source (7/58-69). The examples use contact copying processes, with example XXXII using a mercury lamp. The use of a non-imagewise exposure after forming the holographic image and may improve the quality of the hologram. (9/40-52).

It would have been obvious to one skilled in the art to modify the process of Pettigrew et al. '780 by using the incoherent light sources disclosed by Haugh '526 as curing holographic photopolymeric recording materials with a reasonable expectation of success. This is a new rejection and therefore the arguments are moot.

13      Claims 41-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pettigrew et al. '780 and Haugh '526, in view of Ingwall et al. '912 and Sutherland et al. WO 01/90822.

Ingwall et al. '912 (discussed in Molteni et al. '853) teaches coating photopolymerizable acrylic/acrylate materials onto indium tin oxide (ITO) coated glass substrates, exposing and fixing the holograms with a UV exposure followed by filling the voids in the hologram with liquid crystal materials (example 1, 4/6-5/55). Example 2 further coats these with an alignment layer coated on a ITO coated glass plate, which allows the application of a voltage to control the diffraction efficiency of the hologram. (5/59-6/2). The use of in-situ polymerization of compositions containing liquid crystals and polymeric precursors is disclosed as known as polymer dispersed liquid crystal materials (PDLC). (1/37-53)

Sutherland et al. WO 01/90822 teach contact exposure of PDLC materials with respect to figure 4. The master may be various hologram types including thin, volume, surface and multiplexed holograms (page 21/ line 31-page 22/line 32). Post recording processing , including exposure is disclosed. (24/3-9). Useful PDLC compositions include the LC mixture E7. (16/15-27).

In addition to the basis provided above, the examiner holds that it would have been obvious to one skilled in the art to modify the process of Pettigrew et al. '780 and Haugh '526, by using contact exposure of the master with a PDLC composition such as that disclosed by

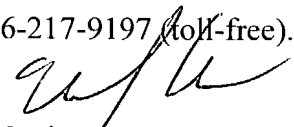
Sutherland et al. WO 01/90822 to facilitate forming a electronically variable diffraction efficiency in the holographic medium, coated in a ITO/glass plate laminate and followed by providing the exposed side with an ITO coated glass plate as taught by Ingwall et al. '912 to remove the need to fill the voids with LC material required with the compositions of Ingwall et al. '912 and to improve the degree of contact between the master and the recording material, thus allowing UV or incoherent sources to be used in the copying process as taught by Haugh '526.

This is a new rejection and therefore the arguments are moot.

14 Any inquiry concerning this communication or earlier communications from the examiner should be directed to Martin J Angebrannndt whose telephone number is 571-272-1378. The examiner can normally be reached on Monday-Thursday and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Martin J Angebrannndt  
Primary Examiner  
Art Unit 1756

03/16/2004